College Quarterly
Winter 2005 - Volume 8 Number 1

Home
Contents

Have 3D, Will Travel

by Mike R. Duncan, Bob Birrell, and Toni Williams

Virtual Reality (VR) is primarily a visual technology. Elements such as haptics (touch feedback) and sound can augment an experience, but the visual cues are the prime driver of what an audience will experience from a VR presentation. The history of VR extends back to the 1950's when specially created movies were used to give a person the impression of being in a new or impossible place. Hollywood soon grabbed on to this vision of being able to create artificial places with full sensory representation in order to make some spectacular movies. Unfortunately, the reality of VR is less all encompassing, and the eyes are what VR is designed to fool.

At its inception in 2001 the Centre for Advanced Visualization (CFAV) at Niagara College of Arts and Technology was equipped with state-of-the-art VR technology. The computer, screen and sound system were all arranged into a 'Reality Centre' (RC). The reality centre was an SGI concept that saw VR being used in order to bring disparate groups of engineers together on a project so that they could talk together while they explored their data using VR technology. Engineers were the primary target because they work with CAD data which is easily brought into VR environments. The computer used to drive the Reality Centre was a 'super-computer', which means that it was able to assemble and display far more data than an engineers' personal workstation. A large number of Reality Centres were sold across North America and Europe based on this model. Additional technologies such as CAVES and PowerWalls were also employed in the same manner. The Niagara College CFAV Reality Centre was opened in October 2001 with nearly 140 local manufacturing companies present.

CFAV began its participation in the technology transfer process with a staff of four, including 1 student. The initial projects hosted by the facility were IRAP (Industry Research Assistance Program) projects involving the introduction of new technology, or new processes. The initial idea for these projects was to show the technical workings of the proposed technology in a realistic setting. For example, the introduction of some new track technology for use in velodromes would show a realistic velodrome with a realistic depiction of the new tracks. Similar approaches were taken on a number of other projects, and it soon became clear that it was the realistic depiction rather than the representation of the technology that was of key interest to the developers. Indeed, these developers needed a way to show their new product to their investors.

CFAV's first big project involved the Peace Bridge between Fort

Erie and Buffalo. This project was managed by Parsons Transportation and involved a number of bi-national players. The target was to build a model of Fort Erie and Buffalo with sufficient detail that lay-people would be able to evaluate any new bridges, or proposed changes to the old bridge. The model took some 6 months to assemble and articulate. During this time the facility continued to conduct demos and engage new partners. One visit in particular had much to do with the then future direction of the technology at the facility. The City of Welland visited one day and asked whether the technology could be made portable. They wanted to use VR technology to take a digital representation of the City of Welland to potential investors. This introduced three new ideas; 1) the use of VR as an economic development tool, and 2) the transition of VR from fixed to portable assets, and 3) that VR was, at its core, a communications tool. Developments in the Peace Bridge and other projects also soon applied pressure for the introduction of a portable form of VR, and emphasis on the communications aspect of the technology.

At the same time that CFAV was dealing with its first projects, the world of computer graphics was being turned on its ear. New and more capable graphics adaptors for PCs were being introduced every six months, with each successive generation an order of magnitude more powerful than the rest. The initial projects engaged by the facility spanned the introduction of the first graphics GPUs (graphics processing units), a fundamental development in the power of PC graphics technology. GPUs are, as of this writing, in their 7th generation. The development of GPUs enabled the creation of portable VR. By the end of 2002 there were PC graphics cards with an order of magnitude more graphics power than the facility's super-computer.

The demand for portable VR and the development of GPUs resulted in CFAV creating its first graphics engine. CFAV's first portable graphics engine was called NewtView and it was built to support the models being created with the modeling tools in use at the time. In short order, CFAV was able to acquire laptops and PCs equipped with GPUs that allowed its partners to conduct their own VR presentations on their own display technology. All that a customer requires today to conduct a presentation is a GPU equipped computer, a projector and a screen. CFAV's introduction of portable VR enabled a number of possibilities.

CFAV's engagement in the Peace Bridge project introduced the facility to a new kind of partner, the land use planner. A land use planner is an engineer or architect, etc. who must explain their intent or changes to a public site or piece of infrastructure to the public. The land use planning engineers have the unique problem among engineers that they require public approval in order to implement their ideas. A VR presentation can encapsulate an engineer's plans in the context of a detailed scale model of the surroundings such that the public is able to experience the plans and intent. People are visual

creatures and a visual representation that is tractable and easily digestible gives the public a much greater sense of knowing what a project might mean to their neighbourhood than the typical engineering presentation would have. The introduction of portable VR meant that now, the land use planning engineer could encapsulate his/her plans and then show them to an audience at will, and with very little support technology required.

Portable VR enabled the City of Welland to take a digital model of the city to investors on Wall Street. This was an innovative use of VR technology in economic development. The fact that the VR presentations were delivered on Wall Street with a portable laptop computer was acknowledged as a major advantage. Indeed, the use of a laptop allows portable VR to operate without the need for a projector.

Portable VR allowed a total of 27 different Peace Bridge options to be presented to public meetings on both sides of the border. A voting scheme was used to assess which options were viable.

CFAV's technology has now changed to the extent that it uses conventional modeling tools and off-the-shelf technology to produce its presentations. The centre's main viewing lab has now been adapted to use these off-the-shelf components. The replacement for the super-computer is a PC with a Matrox Parhelia GPU. The matrox GPU supports a single Windows desktop across three monitors. The signals from the GPU are taken by the projectors and displayed on the 24 ft double curved screen. The technology which comprises the display portion of CFAV fixed emplacement VR setup is still very viable. Being able to drive the big screen with a GPU means that CFAV can now use all of its creative content and assets in any presentation. As such, CFAV can now offer both fixed emplacement VR presentations for large groups of engineers and the public, as well as portable VR technology to allow our partners to conduct their own presentations.

CFAV's future technology direction will focus on web-development. The existence of GPUs has not escaped the developers of web technology and there are now 3D web-browser plug-ins that would rival the capability of CFAV's super-computer. The use of web-based technology means that visual presentations can draw on any data that are available on the World Wide Web. Indeed, CFAV's research direction is to create a generalized 3D interface template that would allow for the organization of an entire projects' data through one visual interface.

Dr. Mike Duncan is the Chair, Visualization Sciences, Niagara College

Robert Birrell is the Director, Centre for Advanced

Visualization, Niagara College

Toni Williams is the Business Manager, Centre for Advanced Visualization

They can be contacted at Niagara College of Arts and Technology, 135 Taylor Rd. R.R. #4, Niagara-on-the-lake, Ontario L0S 1J0

Contents